Conditional Probability

P(A given B);  P (A/B)
Importance:  P(sample statistic has observed value given that the hypothesis is true)

Intuition

1. Die:  P(# is even), P(# is even given that you know # > 3)
2. One card draw:  P(Red), P(Red given that you know ♥)
   P(♥), P(♥ given that you know red)
   P(♥), P(♥ given that you know black)
   P(4), P(4 given that you know ♠)
3. Two coin tosses: P(2nd is H), P(2nd is H given that you know first is H)
4. Two card draw without replacement:
   P(2nd is ♠), P(2nd is ♠ given that you know first is ♠)

Definition:

\[ P(A/B) = \frac{P(A \cap B)}{P(B)} \]

\[ P(A \cap B) = P(A/B) \cdot P(B) = P(B/A) \cdot P(A) \]

Independence:  P(A/B) = P(A);  P(B/A) = P(B)

Then:  P(A \cap B) = P(A) \cdot P(B)

BAYES

Freund, Section 6.7